

harmonics in the original audio signal such that an enhanced audio signal is produced which exhibits an improved harmonic quality compared to that of the original audio signal. In this way, the present invention can be seen as adding enhancing harmonics to the original audio signal. Sound produced from an audio signal enhanced in accordance with the present invention appears to resist becoming distorted at high volumes and tends to eliminate, or at least significantly reduce, the formation of sweet spots.

When an input audio signal [in the form of a square wave with multiple] having a band of frequencies ranging from a low end to a high end is transmitted through an apparatus according to the principles of the present invention, the [resulting enhanced] frequencies in the input audio signal are [is] non-linearly distorted in amplitude. In particular, [with] frequencies in the input audio signal [which] at least increase in amplitude as per increasing frequencies from a desired reference frequency [toward the high end of the signal] up to an amplitude peak at a high frequency. After this high frequency, it is desirable for the frequencies to decrease in amplitude as per increasing frequencies toward the high end. It is also desirable for the present apparatus to be further operatively adapted so that when the [square wave] audio signal is transmitted therethrough, other frequencies in the [enhanced] input audio signal [also has frequencies which] increase in amplitude as per decreasing frequencies from the reference frequency toward [its] the low end of the band and up to an amplitude peak at a low frequency. It is further desirable, after the low frequency, for the other frequencies to decrease in amplitude as per decreasing frequencies toward the low end.

The previous amendment to page 20, line 23 of the

DETAILED DESCRIPTION OF THE INVENTION section of the present specification (See the Amendment mailed July 2, 1996) is reproduced below in its entirety and additional amendments thereto are as indicated:

Each of the above described embodiments produce generally the same type of enhancement in an electronic audio signal.

Broadly, an apparatus for enhancing the quality of an electronic audio signal, according to the principles of the present invention, comprises a circuit operatively adapted for distorting an input audio signal transmitted therethrough by non-linearly amplifying enhancing harmonics or frequencies in the input audio signal. By increasing the amplitude of enhancing harmonics in this manner, the resulting enhanced audio signal exhibits an improved harmonic quality compared to that of the input audio signal.

Until the present invention, electronic audio signals were not enhanced in this manner. Accordingly, an apparatus for enhancing the quality of an electronic audio signal, according to the principles of the present invention, comprises any circuit operatively adapted for distorting an input audio signal transmitted therethrough into such an enhanced audio signal.

A typical electronic audio signal has a bandwidth of frequencies between a low end and a high end in the range of human hearing. The range of human hearing can vary, but it typically ranges between about 20 Hz on the low end and about 20 KHz on the high end. One way of identifying a circuit according to the present invention is to transmit an electronic audio signal through the circuit, where the audio signal is in the form of a square wave having a [plurality] band of frequencies ranging from a high end to a low end.

When the square wave audio signal is so transmitted and viewed on an oscilloscope, the resulting frequency response

curve of the output audio signal is non-linear and includes
[frequencies which increase] a portion having a positive
slope that increases in amplitude [as per increasing
frequencies] from a desired reference point [frequency]
toward the high end of the signal and up to a high end
amplitude peak. After the high end peak, this portion of
the oscilloscope curve may then change to a negative slope
that decreases in amplitude toward the high end. [It is
desirable for the present circuit to be adapted, like
exemplary circuits above, such that the frequencies of the
square wave signal are increased in amplitude, as per
increasing frequencies, to a high frequency peak.] When the
square wave audio signal is transmitted through some of the
embodiments disclosed herein, the resulting frequency
response curve of the output audio signal will also [exhibit
an increase] include another portion having a positive slope
that increases in amplitude [as per decreasing frequencies]
from the reference point [frequency] toward the low end of
the signal and up to a low end amplitude peak. After the
low end peak, this other portion of the oscilloscope curve
may then change to a negative slope that decreases in
amplitude toward the low end. [This increasing amplitude as
per increasing frequencies and increasing amplitude as per
decreasing frequencies each occur[s] over at least a portion
of the frequency bandwidth of the output audio signal.]

[Satisfactory results have been obtained with
exemplary circuits, such as those described above, which
produce an output audio signal having a reference frequency
of about 1 KHz, when the square wave input audio signal is
transmitted therethrough.] It is desirable for the present
circuit, such as some of the examples described above, to be
designed such that the amplitude of the reference frequency
in the audio signal remains about the same when transmitted
through the circuit. [is substantially similar in amplitude